Corporatica

Software Engineering Task

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1.Task Description

Your mission is to design and implement an advanced software application centered around containerization and deployment technologies. The application's goal is to provide in-depth analysis and manipulation of various data types, bolstered by an engaging front-end showcasing rich animations and visualizations, alongside a complex back-end developed with Python and Flask. Documentation of your work through a detailed presentation, README files, and well-commented scripts is essential.

The application shall process and analyze:

1. **Tabular data:** Handling multiple single-valued features.
2. **RGB images.**
3. **Textual data.**

Back-End Development with Flask:

1. **Tabular Data:**
    - Develop Flask endpoints for uploading, processing, and performing complex queries on tabular data.
    - Implement APIs for computing advanced statistics (mean, median, mode, quartiles, outliers) and visualizations like dynamic charts and graphs.
    - Build a feature for users to perform CRUD (Create, Read, Update, Delete) operations on the dataset through a web interface.
2. **RGB Images:**
    - Create Flask routes for image upload and storage, with support for batch processing.
    - Develop functionality for generating color histograms and segmentation masks, with APIs to adjust parameters and retrieve results.
    - Provide an interface for image manipulation tasks such as resizing, cropping, and format conversion.
3. **Textual Data:**
    - Implement a Flask-based text analysis service capable of performing operations like text summarization, keyword extraction, and basic sentiment analysis.
    - Develop dynamic endpoints for T-SNE visualization generation based on text input.
    - Build APIs for text processing tasks including search, categorization, and custom user-defined queries.

4. **Back-End:**
    - Architect a scalable and secure back-end using Python and Flask, optimized for high-performance data processing and analysis.
    - Utilize Docker for application containerization, with Kubernetes for deployment and scaling, ensuring the application's resilience and maintainability.
    - Incorporate database management systems (SQL or NoSQL) for data storage, retrieval, and real-time querying capabilities.

Front-End Development with React

Objective: Develop a responsive and engaging web interface using React, with a strong emphasis on animations and interactive data visualizations.

1. **React Framework:** Construct a single-page application (SPA) that leverages React's capabilities for real-time user interaction and dynamic content updates.
2. **Animations:**
    - **Integration:** Incorporate React animation libraries such as Framer Motion or React Spring to embed fluid and visually appealing animations.
    - **Use Cases:** Apply animations for transitions between different application states, button clicks, data loading phases, and user interactions to enhance the visual feedback and user experience.
3. **Data Visualization:** Utilize React-compatible libraries like Recharts or Victory to craft dynamic and interactive charts, graphs, and other data representations. These should allow users to interact with the data in a meaningful way, such as zooming, filtering, and detailed view on hover.
4. **Responsive Design:** Implement a responsive design using Tailwind CSS or Styled Components, ensuring compatibility across various devices and screen sizes. Adopt a mobile-first approach to address the majority of user traffic.
5. **Back-End Integration:** Develop efficient mechanisms for the front-end to communicate with back-end services. Use Axios or Fetch API for handling API requests, ensuring the UI reacts smoothly to data changes and state updates.
6. **UI/UX Focus:** Prioritize user experience by applying UX design principles. The application should be intuitive, easy to navigate, and visually appealing, encouraging user engagement.

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Additional Deliverables:

1. **Presentation:** Prepare an in-depth presentation detailing the development process, technical challenges overcome, and the strategic decisions made regarding technology selection. Highlight the application's features through demos and use cases.
2. **Scripts:** Provide all scripts utilized in the project, with detailed comments on their functionality. Instructions for script execution and application interaction must be clear and user-friendly.
3. **README Files:** Include comprehensive README files outlining:
    - **Time Allocation:** Document the time spent on research, development, testing, and deployment activities.
    - **Methodology:** Describe the development methodology, including the selection criteria for technologies, libraries, and frameworks used.

Note on Task Completion and Extension:

Please approach this task with your best effort, aiming to complete as much as possible within the given timeframe. The allocated period for this task is **5 days**. Should you find yourself in need of additional time, you are entitled to request a **2-day extension** on the fourth day of the task period. Good luck with your task! Should you need any assistance or have any questions, don't hesitate to reach out. We're here to support you every step of the way.